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## New way to measure pain

**Quantifying patients' pain more precisely will make it easier to find the optimal way to treat it on an individual basis. This is the concept behind the Pain Monitor project, funded by the French-Norwegian Foundation. The project has developed a new way of thinking about pain management that is attracting major international interest.**

“In the US, it is mandatory to measure pain among patients, and similar rules are being introduced in many European countries,” says Associate Professor Hanne Storm of the University of Oslo’s Institute of Clinical Medicine. “There is much that indicates this will be adopted as a common European guideline, so it will be important to have technology that can quantify pain and discomfort so precisely that we can customise pain treatment.”

### **Modified lie detector**

The Pain Monitor system is the product of research on pain monitoring methods she has been conducting since 1997 through the company Med-Storm Innovation. The system is now in use at a number of hospitals and treatment centres.

“The device is like a modified lie detector,” explains Dr Storm, “measuring skin conductance and ‘emotional sweating’. Conventionally, pain has been measured through the nervous pathways that control blood circulation, such as blood pressure and heart rate. But that can be a very imprecise method since results can be affected by factors such as medication and oxygen deficiency. Emotional sweating, on the other hand, is triggered via different nerve pathways not affected by those compounding factors. So our system’s readings are far more specific to pain and discomfort.”

“We have developed a software program that continuously measures changes in emotional sweating. It’s an extremely sensitive method and we have filtered out much of the interference. The technology follows an individual’s physiological feedback and helps physicians to customise pain management to that individual.”

### **Preventing chronic pain**

Pain monitoring is also important when treating patients who are unable to express their pain, such as premature babies and other infants, and patients in intensive care, in a coma or under general anaesthesia.

“The smallest premature babies use all their energy on growing and healing,” continues Dr Storm, “so it’s not evident when they experience pain. Our technology can detect when they are in pain or feeling discomfort, and help to gauge how much pain medication they need. Reducing pain and stress in newborns results in fewer infections, better growth and earlier discharge from hospital.”

“Good post-operative pain management can help to reduce the problem of longer-term chronic pain, which up to 70 per cent of patients currently experience. We know that patients under general anaesthesia who receive



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too little pain medication may later develop post-traumatic symptoms. Overall, better pain monitoring and management benefits everyone.”

### **Sparse research to draw upon**

The idea underlying the Pain Monitor system has its origin back in 1996, when Dr Storm was studying causal factors in crib death for her doctoral dissertation. She began using the monitoring method that she would eventually develop into the current product. The principles behind her measuring method have long been known – even Sigmund Freud used them – but very little research had been done on how to apply them to pain monitoring.

In 1999 Hanne Storm and Jens O. Gran founded Med-Storm Innovation. Today their company has some 14 patents involving pain, sleep and the design of electrodes used in monitoring pain.

“We started conservatively,” recalls Jens O. Gran. “After three years we found we had strong clinical data to support that our method actually worked, so we began focusing more seriously on the business side and developed a series of prototypes. During our start-up phase we got some important assistance from the University of Oslo's Department of Physics, Innovation Norway and the seed capital fund Sarsia Seed, among others. In 2006 we were able to manufacture the first commercial series of the product.” Mr Gran is Project Manager at Med-Storm Innovation and a board member.

### **Research funding from French-Norwegian Foundation**

So far, roughly 300 Pain Monitor systems have been sold in more than 20 countries. Distribution channels through larger companies such as Philips make it possible for customers to use the product via existing software platforms and operating systems, a strong selling point.

“In 2008 we were one of the three first Norwegian projects to become part of EUREKA’s Eurostars programme,” explains Mr Gran. “Through this project we made contacts at the Research Council of Norway who recommended we apply for funding from the French-Norwegian Foundation. We had already been in contact with Professor Marc Fischler at Foch Hospital in Suresnes, outside Paris, who was very interested in forming a French-Norwegian collaboration on further research.”

### **Monitoring pre-operative pain**

The project funded by the French-Norwegian Foundation started up in 2012, and the research in France focuses on how the Pain Monitor system may improve the treatment of patients at risk for extreme post-operative pain, e.g. after lung operations that involve opening the chest. The goal is to reduce patients’ chronic post-operative pain.

“When we introduce a standardised stimulus to patients under anaesthesia,” says Hanne Storm, “the pain monitor shows that some people react strongly, others hardly at all. We want to see whether those with strong reactions are the same patients who suffer more acute and chronic post-operative pain. The idea is that we should be able to quantify the response using the pain monitor while the patients are under anaesthesia but



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before the operation begins. If we can do that, the next thing is to figure out whether those who react strongly should be administered a different type of pain treatment that leads to less chronic post-operative pain.”

### **French-Norwegian success story**

Professor Fischler believes in the efficacy of the Pain Monitor system and describes the French-Norwegian collaboration as easy and efficient.

“All anaesthesiologists are on the lookout for objective pain monitoring methods. The Pain Monitor system is one of very few solutions available to us. Now we’re going to find out whether the pain threshold measured by the device can be a predictor of chronic pain, and whether pain levels correlate to genetic characteristics of patients.”

“We’re now expanding the project to an additional hospital, in Strasbourg,” says Professor Fischler. “This may be the start of a major French-Norwegian success story.”

More information is available on the Med-Storm website: <http://med-storm.com/index.htm>



Hanne Storm and Jens O. Gran of Med-Storm Innovation have spent years developing the Pain Monitor system.

Photo: Nils Ragnar Løvhaug



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The pain monitoring device is a kind of modified lie detector and is far more targeted than conventional methods.



The technology can even register pain and discomfort in premature babies.



Marc Fischler, from Foch Hospital in Suresnes, outside Paris